59. The laser of Claim 1, wherein said switch further includes a series combination of at least three to six IGBTs in parallel with said other paths.

60. An excimer or molecular fluorine laser, comprising:

a laser tube filled with a laser gas;

an optical resonator;

a discharge circuit;

a plurality of electrodes within the laser tube connected to the discharge circuit for exciting the laser gas to produce a laser output beam,

wherein said discharge circuit includes a solid state switch, and

wherein said switch includes a series combination of at least two IGBTs, said series combination being connected in parallel with a single additional IGBT.

64. The laser of Claim 25, wherein the plurality of IGBTs includes a parallel combination and each path of the parallel combination includes a single IGBT.

REMARKS

Claims 1, 5-15, 19-60 and 64 are pending in this application. Claims 1, 8-10, 14, 30, 35-45, 47, 58-59 and 64 have been amended. No new matter has been added. Support for the amendments to independent Claims 1, 14, 30 and 60 is found, e.g., at page 10, line 10-page 11, line 5, and page 4, lines 8-13,

Claim Rejections Under 35 U.S.C. 102

Claims 1-7, 10, 30-31, 35-40, 58-62 and 65 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. patent no. 5,305,338 to Wakata et al. Claims 2-4, 61-62 and 65 have been cancelled rendering their rejection moot. Each of Claims 1, 5-7, 10, 30-31, 35-40, and 58-60, as now amended, is allowable for the reasons that follow.

Claim 1, as now amended, recites an excimer or molecular fluorine laser comprising a discharge circuit including a solid state switch configured to switch a voltage needed to produce desired pulse energies, the switch comprising a plurality of insulated gate bipolar transistors (IGBTs) including a parallel combination and each path of the parallel combination includes a single IGBT. As understood, Wakata does not disclose this feature. Wakata instead discloses a switch including a myriad number of switch elements. For example, at column 2, line 58, Wakata discloses to have 9078 switch elements. Later, e.g., at column 4, lines 45-47, Wakata discloses a switch device 15 consisting of modules each containing a plurality of solid-state switch elements. Figure 3 itself, which is specifically relied upon by the Examiner, shows parallel paths each including four switch elements connected by dotted lines meaning that Wakata intends to include so many switch elements in each path that it is easier not to draw them all into Figure 3. Applicants' invention, as set forth at amended Claim 1, includes a single IGBT at each path of a parallel combination (i.e., at least two parallel paths). Each of Claims 30 and 60, as now amended, is allowable for the substantially same reasons as amended Claim 1. Each of Claims 5-7, 31, 35-40, and 58-59 is allowable as being dependent from amended Claim 1.

The Examiner's rejection of Claim 10 is respectfully traversed. Claim 10 recites an excimer or molecular fluorine laser comprising a discharge circuit including a solid state switch configured to switch a voltage needed to produce desired pulse energies, wherein peaking capacitors from which current pulses are applied to the electrodes are positioned as close as possible to the electrodes, and sustainer capacitors, also from which current pulses are applied to the electrodes, have an enlarged inductance between them and the discharge electrodes for extending the current pulse. As understood, Wakata does not disclose this feature. The Examiner states that "the capacitors [of Wakata] will be as claimed to promote the normal operation of the device." In other words, the Examiner is asserting that the recited peaking capacitors and the recited sustainer capacitors, although not taught or suggested by Wakata, are nonetheless inherent in the teachings of Wakata. This is not the case. Applicants' advantageous final stage capacitors, or those capacitors from which current pulses are applied to the electrodes, i.e., and not instead to any later stage capacitors, are divided into peaking capacitors positioned as close as possible to the electrodes and sustainer

capacitors which have an enlarged inductance between them and the discharge electrodes for extending the current pulse. This feature is not inherent in the teachings of Wakata. In fact, if any assumptions can be made about the final stage capacitors of Wakata, it would be that a same inductance exists between each of the final stage capacitors and the electrodes.

Claim Rejections Under 35 U.S.C. 103

Claims 8-9 are rejected as being unpatentable over Wakata. The rejection is respectfully traversed. Claim 8 recites an excimer or molecular fluorine laser comprising a discharge circuit including a solid state switch configured to switch a voltage needed to produce desired pulse energies, wherein an additional load is coupled between the main discharge electrodes and peaking capacitors from which current pulses are applied to the electrodes. As understood, this feature is neither taught nor suggested by Wakata. The Examiner concedes that Wakata does not teach this feature. However, the Examiner states that it is well known in the art to include a load resistor in such a position. If this is the case, then the Examiner is respectfully requested to provide the required reference that teaches it, along with the required suggestion to combine this reference with Wakata. Otherwise, the rejection is improper and should be withdrawn. It is submitted that what is generally understood in the art is to maintain a reduced resistance between the final stage capacitors and the electrodes as much as possible to prevent resistive losses.

Claims 11-12, 55 and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wakata in view of U.S. patent no. 5,815,386 to Gordon. This rejection is respectfully traversed. Gordon teaches an AC to DC converter circuit which is in no way related to the subject matter of Applicants' invention. There is no suggestion to apply any of the teachings of Gordon to an excimer or molecular fluorine laser discharge circuit. As such, Gordon represent non-analogous prior art. It therefore would not have been obvious to combine the teachings of Gordon with those of Wakata.

Claims 11, 13, 54 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wakata in view of U.S. patent no. 6,020,723 to Desor et al. This rejection is respectfully traversed. Desor et al. does not represent prior art under 35 U.S.C. 102(b) because Desor et al. issued February 1, 2000, while the priority provisional application serial no. 60/204,095 was filed May 15, 2000, less than one year after the issue date of the Desor et al. patent. It is submitted that this priority provisional application supports Claims 11, 13, 54 and 56. Desor et al. also does not represent prior art under 35 U.S.C. 102(e) because Mr. Andreas Targsdorf invented the subject matter taught by Desor et al. that is being relied upon in the rejection, namely, the protective circuits as set forth at Claims 11, 13, 54 and 56 (Mr. Targsdorf is an inventor named in the present application and also named in the Desor et al. patent). It is further submitted that Desor et al. and the present application were commonly owned at the time of the invention. An assignment to assignee, Lambda Physik AG of Goettingen, Germany, has been recorded in both the Desor et al. patent (reel/frame 8774/0220 and reel/frame 011770/0920) and in the present application (reel/frame 012185/0228). Therefore, according to the provisions of 35 U.S.C. 103(c), Desor et al. does not represent prior art under section 103(a)/102(e) for this additional reason.

Claims 14-22, 32-34, 41-47, 63 and 66-67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wakata in view of U.S. patent no. 5,754,579 to Mizoguchi et al. Claims 16-18, 63 and 66-67 have been cancelled rendering their rejection moot. Claim 14, as now amended, is allowable for the substantially same reasons as amended Claim 1. That is, Claim 14, as amended, recites an excimer or molecular fluorine laser comprising a discharge circuit including a solid state switch ... comprising a plurality of insulated gate bipolar transistors (IGBTs) including a parallel combination and each path of the parallel combination includes a single IGBT .... As discussed above with respect to Claim 1, Wakata, which the Examiner is relying upon to meet Applicants' switch, does not teach or suggest this feature. Claims 15 and 19-22 are allowable each as being dependent from amended Claim 14. Each of Claims 32-34 is allowable as being dependent from amended Claim 30 which is allowable for the substantially same reasons as amended Claims 1 and 14. Each of Claims 41-47 is allowable as being dependent from amended Claim 1.

Claims 23-29, 48-49, 51-52 and 64 are rejected as being unpatentable over Kakehata et al. (Appl. Phys. Lett., Dec. 1992) in view of U.S. patent no. 6,005,880 to Basting et al. This rejection is respectfully traversed. It is submitted that Basting et al. does not represent prior art under 35 U.S.C. 102(b) because Basting et al. issued December 21, 1999, while the priority provisional application serial no. 60/204,095 was filed May 15, 2000, less than one year after the issue date of the Basting et al. patent. It is submitted that this priority provisional application no. 60/204,095 supports Claims 23-29, 48-49, 51-52 and 64. It is further submitted that Basting et al. and the present application were commonly owned at the time of the invention. An assignment to assignee, Lambda Physik AG of Goettingen, Germany, has been recorded in both the Basting et al. patent (reel/frame 011770/0884) and in the present application (reel/frame 012185/0228). Therefore, according to the provisions of 35 U.S.C. 103(c), Basting et al. does not represent prior art under section 103(a)/102(e).

In view of the above, it is respectfully submitted that the application is now in condition for allowance. The Examiner's reconsideration and further examination are respectfully requested.

In the event any fee is required for filing the above-noted document, including any fees required under 37 CFR 1.136 for any necessary Extension of Time to make the filing of the attached document timely, the Assistant Commissioner is hereby authorized to charge the fee to our Deposit Account No. 50-0612. A duplicate copy of this page is enclosed.

Respectfully submitted,
Sierra Patent Group, Ltd.

Dated: 1-10-03

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Claims 23-29, 48-49, 51-52 and 64 are rejected as being unpatentable over Kakehata et al. (Appl. Phys. Lett., Dec. 1992) in view of U.S. patent no. 6,005,880 to Basting et al. This rejection is respectfully traversed. It is submitted that Basting et al. does not represent prior art under 35 U.S.C. 102(b) because Basting et al. issued December 21, 1999, while the priority provisional application serial no. 60/204,095 was filed May 15, 2000, less than one year after the issue date of the Basting et al. patent. It is submitted that this priority provisional application no. 60/204,095 supports Claims 23-29, 48-49, 51-52 and 64. It is further submitted that Basting et al. and the present application were commonly owned at the time of the invention. An assignment to assignee, Lambda Physik AG of Goettingen, Germany, has been recorded in both the Basting et al. patent (reel/frame 011770/0884) and in the present application (reel/frame 012185/0228). Therefore, according to the provisions of 35 U.S.C. 103(c), Basting et al. does not represent prior art under section 103(a)/102(e).

In view of the above, it is respectfully submitted that the application is now in condition for allowance. The Examiner's reconsideration and further examination are respectfully requested.

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Respectfully submitted,
Sierra Patent Group, Ltd.

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1. (Amended) An excimer or molecular fluorine laser, comprising:

a laser tube filled with a laser gas;

an optical resonator;

a discharge circuit; and

a plurality of electrodes within the laser tube connected to a discharge circuit for exciting the laser gas to produce a laser output beam, said discharge circuit including a solid state switch configured to switch a voltage needed to produce desired pulse energies [without having a step-up transformer disposed within the circuit after the switch], the switch comprising a plurality of insulated gate bipolar transistors (IGBTs) including a parallel combination and each path of the parallel combination includes a single IGBT.

8. (Amended) [The laser of claim 1] An excimer or molecular fluorine laser, comprising:

a laser tube filled with a laser gas;

an optical resonator;

a discharge circuit; and

a plurality of electrodes within the laser tube connected to a discharge circuit for exciting the laser gas to produce a laser output beam, said discharge circuit including a solid state switch configured to switch a voltage needed to produce desired pulse energies,

wherein an additional load is coupled between the main discharge electrodes and peaking capacitors from which current pulses are applied to the electrodes.

10. (Amended) [The laser of claim 1] An excimer or molecular fluorine laser, comprising:

a laser tube filled with a laser gas;

an optical resonator;

a discharge circuit; and

a plurality of electrodes within the laser tube connected to a discharge circuit for exciting the laser gas to produce a laser output beam, said discharge circuit including a solid state switch configured to switch a voltage needed to produce desired pulse energies,

wherein peaking capacitors from which current pulses are applied to the electrodes are positioned as close as possible to the electrodes, and sustainer capacitors, also from which current pulses are applied to the electrodes, have an enlarged inductance between them and the discharge electrodes for extending the current pulse.

14. (Amended) An excimer or molecular fluorine laser, comprising:

a laser tube filled with a laser gas;

an optical resonator;

a discharge circuit;

a plurality of electrodes within the laser tube connected to the discharge circuit for exciting the laser gas to produce a laser output beam, said discharge circuit including a solid state switch configured to switch between half and a quantity less than a voltage needed to produce desired pulse energies [without having a step-up transformer disposed within the circuit after the switch], the switch comprising a plurality of insulated gate bipolar transistors (IGBTs) including a parallel combination and each path of the parallel combination includes a single IGBT, and

wherein the discharge circuit includes a voltage doubling circuit configured to approximately double the voltage signal applied to a pulse compressor circuit before the pulse reaches the electrodes.

30. (Amended) An excimer or molecular fluorine laser, comprising:

a laser tube configured to be filled with a laser gas;

an optical resonator; and

a plurality of discharge electrodes disposed within a discharge chamber, the chamber including a pair of discharge electrodes coupled to a discharge circuit for

exciting the laser gas for generating a laser output beam, the discharge circuit including a solid state switch comprised of a plurality of insulated gate bipolar transistors (IGBTs) configured to switch a voltage signal of between 12 and 25 kV, the switch including a parallel combination and each path of the parallel combination includes a single IGBT.

35. (Amended) The laser of claim 30, wherein the plurality of IGBTs includes at least [three] two IGBTs connected in series.

36. (Amended) The laser of Claim 30, wherein the plurality of IGBTs includes at least [two] three series combinations of [one or more IGBTs] a single IGBT connected in parallel.

37. (Amended) [A method of providing an excimer or molecular fluorine laser, comprising the steps of:

filling a laser tube with a laser gas;

providing an optical resonator; and

disposing a plurality of electrodes within a discharge chamber, the chamber including a pair of electrodes connected to a discharge circuit for exciting the laser gas to produce a laser output beam, said discharge circuit including an] The laser of Claim 1, said all solid state switch configured to switch [a] said voltage needed to produce said desired pulse energies without having a step-up transformer disposed within the circuit after the switch.

38. (Amended) The [method] laser of claim 37 wherein said solid state switch includes a series of insulated gate bipolar transistors (IGBT), said discharge circuit not including a step up voltage transformer.

39. (Amended) The [method] laser of claim 38 wherein said series of IGBTs are configured to switch a voltage signal of approximately 20 kV.

40. (Amended) The [method] laser of claim 39 wherein the solid state switch has a rise time of less than 100 ns.

41. (Amended) The [method] laser of claim 37 further including [the step of] a voltage doubling circuit for doubling the voltage signal applied to the pulse compressor circuit before the pulse reaches the pair of electrodes.

42. (Amended) The [method] laser of claim 41 wherein said doubling [step] circuit includes [the step of providing a voltage doubling circuit] a pair of capacitors.

43. (Amended) The [method] laser of claim 42 wherein said solid state switch includes [a series of insulated gate bipolar transistors (IGBT), said discharge circuit not including a step up voltage transformer] at least three parallel paths each including a single IGBT.

44. (Amended) The [method] laser of claim 43 wherein said series of IGBTs are configured to switch a voltage signal of approximately 20 kV.

45. (Amended) [An excimer or molecular fluorine laser system, comprising:

a laser tube filled with a gas mixture including an active halogen component;

a pulsed discharge circuit;

a plurality of electrodes within the laser tube connected to the discharge circuit for energizing the gas mixture; and

an optical resonator for generating a laser beam,] The laser of Claim 1, wherein the discharge circuit comprises:

[a] said solid state switch for switching an electrical pulse provided by a main storage capacitor charged by a power supply;

a voltage doubling circuit including a pair of capacitors for doubling the voltage of the pulse switched by the solid state switch; and

a pulse compression circuit for compressing the pulse for application to the electrodes.

47. (Amended) [An excimer or molecular fluorine laser system, comprising:

a laser tube filled with a gas mixture including an active halogen component;

a pulsed discharge circuit;

a plurality of electrodes within the laser tube connected to the discharge circuit for energizing the gas mixture; and

an optical resonator for generating a laser beam,] The laser of Claim 1,

wherein the discharge circuit comprises:

[a] said solid state switch including [a] said plurality of IGBTs for switching an electrical pulse provided by a main storage capacitor charged by a power supply, said electrical pulse having sufficient energy to produce laser pulses of desired energies without disposing a step-up transformer in the discharge circuit after the switch ; and

a pulse compression circuit for compressing the pulse for application to the electrodes.

58. (Amended) [An excimer or molecular fluorine laser, comprising:

a laser tube filled with a laser gas;

an optical resonator;

a discharge circuit;

a plurality of electrodes within the laser tube connected to the discharge circuit for exciting the laser gas to produce a laser output beam,

wherein said discharge circuit includes a solid state switch, and] The laser of Claim 1,

wherein said switch further includes a series combination of at least two IGBTs in parallel with said other paths.